CORD

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MANIKIN TESTING ON A VARIETY OF LAND AND SEA SURVIVAL EQUIPMENT

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EXECUTIVE SUMMARY

As part of the Thrust 3id12 and a tasking from the Air Forces, DRDC Toronto required testing to be conducted on a thermal manikin to evaluate the thermal performance of land and sea survival equipment. This report details the results of using the current flyer's coverall immersion suit with three (3) prototype thermal liners in still and turbulent water (30 cm wave). These results will be compared to values recorded from human subjects using the same wave height tested at the same test facility (wave tank).

1.0 INTRODUCTION

1.1 BACKGROUND:

As part of the Thrust 3id12 and a tasking from the Air Forces, DRDC Toronto requires testing to be conducted on a thermal manikin to evaluate the thermal performance of land and sea survival equipment. Parallel to the manikin testing, human testing will be performed using the same sea survival equipment and the same test facilities (wave tank).

1.2 AIM:

To measure the thermal performance of various land and sea survival equipment in still water and 30 cm wave conditions.

1.3 STATEMENT OF WORK:

The project will determine, utilizing a standardized, validated and reliable protocol (formally agreed upon between contractor and scientific authorities), the thermal performance in wind on various land and sea survival equipment. The details of the manikin test conditions are as follows:

1. Winter dressed (dry) in -30°C sleeping bag with cold wind;
2. Winter dressed (dry) in proposed sleeping bag # 1 (-4°C) with cold wind;
3. Winter dressed (dry) in proposed sleeping bag # 2 (-10°C) with cold wind;
4. Winter dressed (dry) in current life raft with cold wind;
5. Winter dressed (dry) in proposed life raft with cold wind;
6. Winter dressed (dry) in -30°C sleeping bag and life raft with cold wind;
7. Winter dressed (dry) in proposed sleeping bag # 1 (-4°C) and life raft with cold wind;
8. Winter dressed (dry) in proposed sleeping bag # 2 (-10°C) and life raft with cold wind;
9. Winter dressed (dry) in -30°C sleeping bag and life raft over inflated life vest with cold wind;
10. Winter dressed (wet) in -30°C sleeping bag with cold wind;
11. Winter dressed (wet) in proposed sleeping bag # 1 (-4°C) with cold wind;
12. Winter dressed (wet) in proposed sleeping bag # 2 (-10°C) with cold wind;
13. Winter dressed (wet) in current life raft with cold wind;
14. Winter dressed (wet) in proposed life raft with cold wind;
15. Winter dressed (wet) in -30°C sleeping bag and life raft with cold wind;
16. Winter dressed (wet) in proposed sleeping bag # 1 (-4°C) and life raft with cold wind;
17. Winter dressed (wet) in proposed sleeping bag # 2 (-10°C) and life raft with cold wind;
18. Winter dressed (wet) in current life raft with cold wind in water;
19. Winter dressed (wet) in proposed life raft with cold wind in water;
20. Dressed with modified constant wear immersion suit with TQH Thinsulate liner dry, in water with waves;
21. Dressed with modified constant wear immersion suit with TQH Thinsulate liner wet (2 L of water added to the suit) in water with waves;
22. Dressed with modified constant wear immersion suit with FQH foam liner dry, in water with waves;
23. Dressed with modified constant wear immersion suit with FQH foam liner wet (2 L water), in water with waves;
24. Dressed with modified constant wear immersion suit with 2-piece winter liner dry, in water with waves;
25. Dressed with modified constant wear immersion suit with 2-piece winter liner wet (2 L water), in water with waves;
26. Dressed with modified constant wear immersion suit with TUQH Thinsulate liner dry, in still but circulated water;

1.3 STATEMENT OF WORK (Contd.):

27. Dressed with modified constant wear immersion suit with FQH foam liner dry, in still but circulated water; and
28. Dressed with modified constant wear immersion suit with TQH Thinsulate liner dry, in still but circulated water.

DRDC Toronto will provide all the clothing and equipment required for the manikin tests. The contractor will make available the same test facilities used for the manikin testing for the human testing, i.e. wave pool and dressing area.

2.0 REFERENCES

2.1 CORD Document No. R95-018 (1995). Implementation of Test Protocol of Thermal Manikin Test System. The CORD Group Limited, Dartmouth: May 1995.

3.0 METHOD

3.1 METHODOLOGY:

The thermal performance of various land and sea survival equipment in wind was determined using a Thermal Instrumented Manikin Test System. During each test, environment, temperature, skin temperature and power consumption was recorded.

3.2 THERMAL MANIKIN TEST SYSTEM:

The Thermal Manikin Test System is a means for evaluating the thermal insulation of thermal protective clothing. In particular, this refers to survival suits for ocean emergencies and, in general, it refers to any human-use apparel. The system consists of a hollow aluminum manikin equipped with temperature sensors and electric heaters connected to a computer system.

In operation, the manikin is dressed in the human-use apparel to be tested and placed in an appropriate environment. The computing equipment then controls the heaters to maintain the skin of the manikin at a set temperature and measures the electrical power required to do so. This power is equivalent to the heat that escaped through the clothing due to the temperature difference across it. The power and temperature differences are then used, along with the known surface area of the manikin to calculate the thermal resistance offered by the apparel.

The system is designed for flexibility and ease of operation. To allow for different types of clothing, different sections of the manikin can be included or eliminated from the test as required. The basic philosophy on which the design is based is that the thermal performance of a garment can be evaluated by unmanned tests on the whole garment under conditions identical or similar to actual operating conditions. This philosophy dictates that the system employs a life-sized watertight manikin capable of being heated to and maintained at a selected temperature.

Figure 1 gives a total view of the system. The visible components are the Thermally Instrumented Manikin (TIM), the control module, the computer, the environmental temperature sensors and the cables connecting these components. Basically, the manikin provides a shape of human proportions to fit inside the test garment. The combinations of the aluminum shell of the manikin and the output of heaters inside it provide for an approximately uniform temperature over the manikin surface. This temperature is sensed by sensors embedded in the manikin's shell and passed to the control module. The control module houses the programmed data acquisition system, the heater relays and other circuit components. The data acquisition system receives data from the temperature sensors on the manikin and controls the heater relays so that the manikin surface temperature remains constant. It also measures the environment temperature and the power applied to the manikin and is programmed with the surface area of the manikin. With this temperature, power

3.2 THERMAL MANIKIN TEST SYSTEM (Contd.):

and area data, it calculates the insulation value of the garment and passes this, along with other pertinent data to the computer. The computer acts as a control and display terminal and post-processor.

FIGURE 1

4.0 TEST EQUIPMENT

4.1 Control Module.
Model #: Micro-Mac 5000. Serial #: 98-9109404-001.
Last Calibration Date: March 31, 2003.
Calibration Due Date: March 31, 2004.

4.2 Instrumented Manikin.
Model #: TIM 1.
Last Calibration Date: March 31, 2003.
Calibration Due Date: March 31, 2004.

4.3 Desktop Computer.
Model #: MID-MSI 2600 ATX.
Calibration not required.

5.0 TEST CONDITIONS

5.1 Testing was conducted in water with an air and water temperature recorded at:

5.1.1	Ambient Air:	10.8 – 10.1	N/A
5.1.2	Water temperature:	9.98 – 9.63	12.36 – 12.93
5.1.2	Relative Humidity:	50.0 – 65.0 ± 5 %	65.0 – 75.0 ± 5 %

Despite the unintentional changes in the ambient air and water temperature, the conditions are not critical to the results rather it is the difference between the air/water temperature and body temperature, and that the latter was maintained constant across all conditions.

6.0 TEST ITEMS

6.1 Thermal Instrumented Manikin dressed in test garment, undergarment, and auxiliary component ensembles described in table 6.2.1, 6.3.1, and 6.4.1.

6.2 Table 6.2.1 illustrates the garments requested.

6.3 Table 6.3.1 illustrates the undergarments requested.

6.4 Table 6.4.1 illustrates the auxiliary components required for testing.

Run #	Garments
20 - 25	Modified constant wear immersion suit size 10
26 - 28	Modified constant wear immersion suit size 9

Table 6.2.1

Run #	Undergarments
20 - 25	2-piece long sleeve, legged cotton underwear
20 - 28	1 pair heavy weight wool socks
20, 21, 28	Liner number TQH Thinsulate size 9
22, 23, 27	Liner number FQH foam size 9
24, 25	2-piece winter liner size 9
26	Liner number TUQH Thinsulate size 9

Table 6.3.1

Run #	Auxiliary Components
20 - 28	LPSV life jacket inflated
	Neoprene hood
	1 pair of neoprene 3 finger mitts
20 - 25	1 pair of neoprene boots
20 - 28	Flotation positioning frame
26 - 28	1 pair leather flight boots

Table 6.4.1

7.0 TEST PROCEDURE

The land and sea survival equipment were tested using the procedures as directed in CORD Document No. R95-018 Implementation of Test Protocol of Thermal Manikin Test System May 1995. The manikin was lifted using an overhead hoist. The manikin was dressed in the above undergarment and garment ensembles and secured. Auxiliary components were added over the garments as described in Section 6.0 Test Items. The manikin was positioned into the prescribed test environments by lowering it into the water and positioned in the centre of the test tank in the natural flotation position. The environmental sensors were attached to the flotation frame to provide the environmental temperature. The still but circulated water test environment was achieved by using an attached submersible pump to the flotation frame. A wave generator consisting of a hydraulic ram connected to a paddle board located a one of the test tank provided a 30 cm wave with a wave period of 2.5 seconds environment for testing.

Entering all pertinent information into the system's computer started a warm up period, while all sections of the manikin were warming up to the selected skin temperature. During that time, the conditions for the prescribed tests were implemented. Once all sections of the manikin reached the set point, the test automatically commenced. The test duration was four (4) hours or until the manikin achieved steady state condition.

8.0 RESULTS

8.1 Table 8.1.1 illustrates final results of the thermal resistance testing rounded to four decimal points.

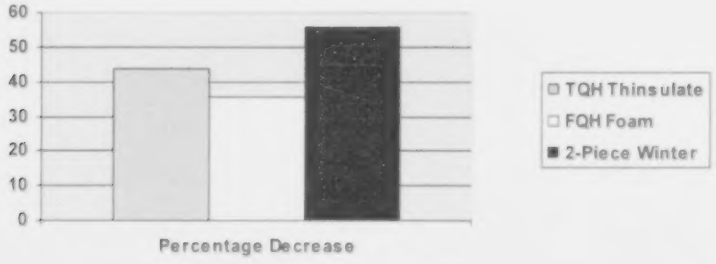
Run #	Description	Condition	Result CLO
20	Modified constant wear immersion suit, TQH Thinsulate liner, no leakage added	30 cm wave	0.6390
21	Modified constant wear immersion suit, TQH Thinsulate liner, 2 litres of leakage added to suit system	30 cm wave	0.3592
22	Modified constant wear immersion suit, FQH foam liner, no leakage added	30 cm wave	0.7777
23	Modified constant wear immersion suit, FQH foam liner, 2 litres of leakage added to the suit system	30 cm wave	0.5010
24	Modified constant wear immersion suit, 2-piece winter liner I, no leakage added	30 cm wave	0.9131
25	Modified constant wear immersion suit, 2-piece winter liner, 2 litres of leakage added to the suit system	30 cm wave	0.4047
26	Modified constant wear immersion suit, TUQH Thinsulate liner, no leakage added, no 2-piece long sleeved, legged cotton underwear, 300 grams accidental leakage in the suit system	Still water	0.5610
27	Modified constant wear immersion suit, FQH foam liner, no leakage added, no 2-piece long sleeved, legged cotton underwear, 300 grams accidental leakage in the suit system	Still water	0.6365
28	Modified constant wear immersion suit, TQH Thinsulate liner, no leakage added, no 2-piece long sleeved, legged cotton underwear, 400 grams accidental leakage in the suit system	Still water	0.5848

Table 8.1.1

8.2 Graph 8.2.1 illustrates the effects of leakage on the insulation values of each liner configurations

Graph 8.2.1

8.3 Graph 8.3.1 illustrates the percentage decrease in insulation values of each liner configurations.



Graph 8.3.1

ANNEX "A"
RAW DATA

TEST NUMBER: 1949
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\timl_1_34beta\M0402TW1.TM1
DATE OF TEST: 03-05-2004
START TIME: 10:33:59
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,NEOPRENE BOOTS,NEOPRENE HOOD/GLOVES,LPSV VEST.
UNDERGARMENTS: LINER NUMBER TQH THINSULATE SIZE 9,2-PIECE LONG SLEEVE,LEGGED COTTON UNDERWEAR,HEAVY WEIGHT WOOL SOCKS.
ENVIRONMENT: 30 CM WAVE.
  POSITION: NATURAL FLOTATION POSITION.
  HUMIDITY: 65
  ENV. FLOW SPEED:
  DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: WRIST SEALS TAPED.
STOP TIME: 11:33:58 MINUTES SINCE START OF TEST: 60.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.98 AVERAGE OVER TEST TIME: 9.98

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	25.50	25.48	15.49	15.49	56.13	61.26	0.2417	0.2214
Chest	32.00	32.02	22.04	22.04	20.10	30.94	1.1017	0.7156
Back	32.00	31.99	22.01	22.01	68.98	59.92	0.3423	0.3941
Abdomen	32.00	32.01	22.03	22.03	9.87	9.45	0.7901	0.8258
Buttocks	32.00	32.01	22.03	22.03	10.19	10.77	1.2007	1.1360
Right Arm	32.00	32.00	22.02	22.02	15.49	20.36	1.0417	0.7925
Left Arm	32.00	32.00	22.02	22.02	19.10	17.68	0.7586	0.8195
Right Hand	32.00	32.01	22.03	22.03	14.54	16.12	0.4801	0.4329
Left Hand	32.00	32.10	22.12	22.12	14.05	13.71	0.4897	0.5018
Right Leg	32.00	32.00	22.02	22.02	49.50	47.89	1.0225	1.0569
Left Leg	32.00	32.00	22.02	22.02	40.17	43.00	1.1738	1.0964
Right Foot	32.00	32.03	22.05	22.05	14.02	9.60	0.6950	1.0154
Left Foot	32.00	32.05	22.07	22.07	12.28	10.88	0.7817	0.8821
Overall					344.41	351.58	0.6702	0.6536

Total Power (W) For All Sections: 351.582
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.6536

STOP TIME: 12:47:58 MINUTES SINCE START OF TEST: 134.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.98 AVERAGE OVER TEST TIME: 9.98

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	25.50	25.48	15.51	15.51	66.10	59.62	0.2054	0.2277
Chest	32.00	32.03	22.05	22.05	26.28	30.58	0.8426	0.7244
Back	32.00	31.99	22.01	22.01	82.54	68.55	0.2861	0.3445
Abdomen	32.00	32.00	22.03	22.03	5.48	9.05	1.4224	0.8617
Buttocks	32.00	32.00	22.03	22.03	11.43	10.92	1.0701	1.1200
Right Arm	32.00	32.00	22.02	22.02	25.49	21.34	0.6332	0.7562
Left Arm	32.00	32.00	22.02	22.02	17.38	17.41	0.8337	0.8325
Right Hand	32.00	32.00	22.03	22.03	15.78	16.68	0.4422	0.4184
Left Hand	32.00	32.09	22.12	22.12	8.43	13.96	0.8158	0.4926
Right Leg	32.00	32.00	22.02	22.02	73.43	49.55	0.6894	1.0217
Left Leg	32.00	32.00	22.02	22.02	45.50	42.97	1.0365	1.0975
Right Foot	32.00	32.03	22.06	22.06	9.23	9.22	1.0566	1.0569
Left Foot	32.00	32.05	22.07	22.07	12.61	11.12	0.7612	0.8634
Overall					399.69	360.97	0.5770	0.6390

Total Power (W) For All Sections: 360.971
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.6390

TEST NUMBER: 1950
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\tim1_1_34beta\M0402TW2.TM1
DATE OF TEST: 03-05-2004
START TIME: 14:11:46
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,NEOPRENE BOOTS,NEOPRENE HOOD/GLOVES,LPSV VEST.
UNDERGARMENTS: LINER NUMBER TQH THINSULATE SIZE 9,2-PIECE LONG SLEEVE,LEGGED COTTON UNDERWEAR,HEAVY WEIGHT WOOL SOCKS.
ENVIRONMENT: 30 CM WAVE.
POSITION: NATURAL FLOTATION POSITION.
HUMIDITY: 65
ENV. FLOW SPEED:
DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: WRIST SEALS TAPED, 2 LITRES OF LEAKAGE ADDED TO THE SUIT SYSTEM.
STOP TIME: 14:41:46 MINUTES SINCE START OF TEST: 30.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.96 AVERAGE OVER TEST TIME: 9.96

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	24.00	23.94	13.98	13.98	68.35	64.22	0.1791	0.1906
Chest	32.00	31.99	22.03	22.03	43.05	34.64	0.5140	0.6389
Back	29.50	29.45	19.49	19.49	79.87	78.68	0.2619	0.2658
Abdomen	32.00	32.00	22.04	22.04	14.19	10.70	0.5501	0.7292
Buttocks	30.50	30.35	20.39	20.39	45.02	44.04	0.2516	0.2572
Right Arm	32.00	32.00	22.04	22.04	31.81	27.69	0.5079	0.5834
Left Arm	32.00	32.00	22.04	22.04	20.11	24.65	0.7214	0.5884
Right Hand	32.00	32.05	22.09	22.09	12.72	13.53	0.5502	0.5170
Left Hand	32.00	32.06	22.10	22.10	13.65	13.43	0.5036	0.5117
Right Leg	32.00	31.99	22.03	22.03	158.33	157.38	0.3198	0.3218
Left Leg	32.00	32.00	22.04	22.04	125.68	126.10	0.3755	0.3743
Right Foot	32.00	32.02	22.06	22.06	10.68	11.83	0.9124	0.8243
Left Foot	32.00	32.00	22.04	22.04	16.66	15.72	0.5752	0.6098
Overall					640.11	622.61	0.3558	0.3664

Total Power (W) For All Sections: 622.612
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.3664

STOP TIME: 15:11:46 MINUTES SINCE START OF TEST: 60.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.96 AVERAGE OVER TEST TIME: 9.96

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	24.00	23.92	13.96	13.96	63.26	65.33	0.1932	0.1871
Chest	32.00	31.99	22.03	22.03	36.74	36.07	0.6023	0.6134
Back	29.50	29.41	19.45	19.45	79.54	79.29	0.2624	0.2632
Abdomen	32.00	32.00	22.04	22.04	7.41	11.03	1.0536	0.7079
Buttocks	30.50	30.17	20.21	20.21	44.77	44.53	0.2508	0.2522
Right Arm	32.00	32.00	22.04	22.04	26.94	28.28	0.5996	0.5711
Left Arm	32.00	32.00	22.04	22.04	29.52	25.81	0.4913	0.5618
Right Hand	32.00	32.04	22.08	22.08	10.98	13.91	0.6367	0.5028
Left Hand	32.00	32.06	22.10	22.10	13.16	13.58	0.5223	0.5059
Right Leg	32.00	31.99	22.03	22.03	169.86	160.48	0.2981	0.3155
Left Leg	32.00	32.00	22.04	22.04	143.79	128.86	0.3282	0.3662
Right Foot	32.00	32.02	22.06	22.06	13.09	11.83	0.7444	0.8242
Left Foot	32.00	32.00	22.04	22.04	17.78	15.68	0.5390	0.6114
Overall					656.84	634.69	0.3485	0.3592

Total Power (W) For All Sections: 634.686
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.3592

TEST NUMBER: 1951
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\tim1_1_34beta\M0402TW3.TM1
DATE OF TEST: 03-08-2004
START TIME: 11:56:42
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,NEOPRENE BOOTS,NEOPRENE HOOD/GLOVES,LPSV VEST.
UNDERGARMENTS: LINER NUMBER FQH FOAM SIZE 9,2-PIECE LONG SLEEVE,LEGGED COTTON UNDERWEAR,HEAVY WEIGHT WOOL SOCKS.
ENVIRONMENT: 30 CM WAVE.
  POSITION: NATURAL FLOTATION POSITION.
  HUMIDITY: 60
  ENV. FLOW SPEED:
  DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: WRIST SEALS TAPED.
STOP TIME: 12:46:45 MINUTES SINCE START OF TEST: 50.05
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.74 AVERAGE OVER TEST TIME: 9.74

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.50	16.76	16.76	35.93	31.72	0.4085	0.4626
Chest	32.00	32.07	22.33	22.33	28.05	27.69	0.7996	0.8100
Back	32.00	32.00	22.26	22.26	18.09	29.32	1.3208	0.8147
Abdomen	32.00	32.00	22.27	22.27	7.01	7.19	1.1257	1.0978
Buttocks	32.00	32.00	22.27	22.27	6.29	7.93	1.9678	1.5603
Right Arm	32.00	32.00	22.26	22.26	23.53	22.45	0.6936	0.7268
Left Arm	32.00	32.00	22.27	22.27	31.90	25.34	0.4593	0.5783
Right Hand	32.00	31.84	22.11	22.11	24.78	25.30	0.2827	0.2768
Left Hand	32.00	31.88	22.14	22.14	25.38	22.84	0.2713	0.3015
Right Leg	32.00	32.00	22.26	22.26	54.58	53.84	0.9376	0.9505
Left Leg	32.00	32.00	22.27	22.27	32.40	37.32	1.4717	1.2777
Right Foot	32.00	32.03	22.29	22.29	8.75	9.95	1.1262	0.9902
Left Foot	32.00	32.03	22.29	22.29	10.40	10.56	0.9322	0.9181
Overall					307.07	311.44	0.7814	0.7742

Total Power (W) For All Sections: 311.440
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.7742

STOP TIME: 13:39:45 MINUTES SINCE START OF TEST: 103.05
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.73 AVERAGE OVER TEST TIME: 9.73

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.50	16.77	16.77	34.03	31.69	0.4313	0.4632
Chest	32.00	32.07	22.33	22.33	21.68	28.24	1.0344	0.7942
Back	32.00	32.00	22.26	22.26	28.16	29.47	0.8484	0.8106
Abdomen	32.00	32.00	22.27	22.27	7.24	7.02	1.0890	1.1240
Buttocks	32.00	32.00	22.27	22.27	8.62	7.80	1.4344	1.5852
Right Arm	32.00	32.00	22.26	22.26	19.74	22.61	0.8266	0.7216
Left Arm	32.00	32.00	22.27	22.27	29.94	25.55	0.4894	0.5734
Right Hand	32.00	31.84	22.11	22.11	25.59	25.17	0.2737	0.2783
Left Hand	32.00	31.88	22.14	22.14	24.25	22.84	0.2839	0.3015
Right Leg	32.00	32.00	22.26	22.26	43.45	52.36	1.1780	0.9774
Left Leg	32.00	32.00	22.27	22.27	35.20	36.69	1.3547	1.2997
Right Foot	32.00	32.03	22.30	22.30	9.28	10.05	1.0616	0.9805
Left Foot	32.00	32.04	22.30	22.30	10.04	10.53	0.9661	0.9211
Overall					297.23	310.02	0.8079	0.7777

Total Power (W) For All Sections: 310.015
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.7777

TEST NUMBER: 1952
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\tim1_1_34beta\M0402TW4.TM1
DATE OF TEST: 03-08-2004
START TIME: 14:03:00
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,NEOPRENE BOOTS,NEOPRENE HOOD/GLOVES,LPSV VEST.
UNDERGARMENTS: LINER NUMBER FQH FOAM SIZE 9,2-PIECE LONG SLEEVE,LEGGED COTTON UNDERWEAR,HEAVY WEIGHT WOOL SOCKS.
ENVIRONMENT: 30 CM WAVE.
  POSITION: NATURAL FLOTATION POSITION.
  HUMIDITY: 60
  ENV. FLOW SPEED:
  DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: WRIST SEALS TAPED, 2 LITRES OF LEAKAGE ADDED TO THE SUIT SYSTEM.
STOP TIME: 14:43:02 MINUTES SINCE START OF TEST: 40.05
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.73 AVERAGE OVER TEST TIME: 9.73

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.47	16.74	16.74	47.38	37.35	0.3094	0.3924
Chest	32.00	31.98	22.26	22.26	18.87	27.47	1.1848	0.8140
Back	32.00	31.94	22.22	22.22	44.19	50.19	0.5394	0.4748
Abdomen	32.00	31.96	22.23	22.23	10.88	9.20	0.7239	0.8556
Buttocks	32.00	31.96	22.23	22.23	31.77	31.53	0.3887	0.3917
Right Arm	32.00	31.95	22.23	22.23	24.75	28.52	0.6582	0.5711
Left Arm	32.00	31.96	22.23	22.23	23.76	26.66	0.6156	0.5488
Right Hand	32.00	31.80	22.07	22.07	24.84	23.35	0.2814	0.2994
Left Hand	32.00	31.81	22.09	22.09	23.59	22.72	0.2912	0.3023
Right Leg	32.00	31.97	22.24	22.24	115.83	109.47	0.4414	0.4670
Left Leg	32.00	31.96	22.24	22.24	96.17	84.75	0.4951	0.5618
Right Foot	32.00	31.97	22.25	22.25	8.48	13.80	1.1601	0.7124
Left Foot	32.00	31.98	22.25	22.25	13.06	13.86	0.7411	0.6985
Overall					483.57	478.88	0.4985	0.5066

Total Power (W) For All Sections: 478.878
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.5066

STOP TIME: 15:23:02 MINUTES SINCE START OF TEST: 80.05
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.73 AVERAGE OVER TEST TIME: 9.73

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.48	16.75	16.75	48.70	37.75	0.3012	0.3885
Chest	32.00	32.01	22.28	22.28	37.86	27.32	0.5910	0.8191
Back	32.00	31.97	22.24	22.24	44.81	49.70	0.5325	0.4802
Abdomen	32.00	31.98	22.25	22.25	7.98	9.59	0.9872	0.8220
Buttocks	32.00	31.98	22.25	22.25	30.48	31.15	0.4054	0.3968
Right Arm	32.00	31.98	22.25	22.25	30.06	28.75	0.5425	0.5671
Left Arm	32.00	31.98	22.25	22.25	26.68	27.40	0.5488	0.5342
Right Hand	32.00	31.83	22.10	22.10	24.32	23.05	0.2879	0.3037
Left Hand	32.00	31.82	22.09	22.09	22.42	22.85	0.3064	0.3006
Right Leg	32.00	31.98	22.25	22.25	122.25	112.41	0.4184	0.4550
Left Leg	32.00	31.98	22.25	22.25	94.60	87.59	0.5036	0.5439
Right Foot	32.00	32.00	22.27	22.27	12.75	13.61	0.7716	0.7228
Left Foot	32.00	32.01	22.28	22.28	9.79	13.46	0.9893	0.7199
Overall					512.70	484.64	0.4710	0.5010

Total Power (W) For All Sections: 484.638
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.5010

TEST NUMBER: 1953
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\timl_1_34beta\M0402TW5.TM1
DATE OF TEST: 03-09-2004
START TIME: 10:42:36
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,NEOPRENE BOOTS,NEOPRENE HOOD/GLOVES,LPSV VEST.
UNDERGARMENTS: 2-PIECE WINTER UNDERWEAR SIZE 9,2-PIECE LONG SLEEVE,LEGGED COTTON UNDERWEAR,HEAVY WEIGHT WOOL SOCKS.
ENVIRONMENT: 30 CM WAVE.
  POSITION: NATURAL FLOTATION POSITION.
  HUMIDITY: 50
  ENV. FLOW SPEED:
  DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: WRIST SEALS TAPED.
STOP TIME: 12:02:36 MINUTES SINCE START OF TEST: 80.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.69 AVERAGE OVER TEST TIME: 9.69

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.50	16.81	16.81	28.13	28.45	0.5234	0.5175
Chest	32.00	32.12	22.44	22.44	17.66	12.31	1.2761	1.8311
Back	32.00	32.00	22.31	22.31	23.86	27.90	1.0036	0.8581
Abdomen	32.00	32.00	22.32	22.32	5.57	4.94	1.4186	1.6010
Buttocks	32.00	32.00	22.32	22.32	8.10	8.59	1.5308	1.4426
Right Arm	32.00	32.00	22.31	22.31	12.92	15.71	1.2656	1.0406
Left Arm	32.00	32.00	22.31	22.31	18.60	15.77	0.7894	0.9309
Right Hand	32.00	31.88	22.19	22.19	24.80	24.41	0.2834	0.2879
Left Hand	32.00	31.88	22.20	22.20	22.92	22.29	0.3012	0.3097
Right Leg	32.00	32.00	22.31	22.31	50.86	50.78	1.0082	1.0100
Left Leg	32.00	32.00	22.32	22.32	30.52	32.14	1.5656	1.4870
Right Foot	32.00	32.02	22.34	22.34	8.24	9.53	1.1975	1.0358
Left Foot	32.00	32.04	22.36	22.36	8.26	9.42	1.1769	1.0318
Overall					260.44	262.24	0.9262	0.9196

Total Power (W) For All Sections: 262.240
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.9196

STOP TIME: 13:23:35 MINUTES SINCE START OF TEST: 161.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.68 AVERAGE OVER TEST TIME: 9.68

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.50	16.82	16.82	28.92	28.31	0.5090	0.5200
Chest	32.00	32.12	22.44	22.44	8.45	12.03	2.6682	1.8728
Back	32.00	32.00	22.32	22.32	32.05	27.67	0.7470	0.8654
Abdomen	32.00	32.00	22.32	22.32	3.69	4.77	2.1438	1.6559
Buttocks	32.00	32.00	22.32	22.32	9.67	8.55	1.2815	1.4502
Right Arm	32.00	32.00	22.32	22.32	19.36	17.34	0.8446	0.9433
Left Arm	32.00	32.00	22.32	22.32	19.86	16.78	0.7394	0.8751
Right Hand	32.00	31.87	22.18	22.18	25.75	24.70	0.2729	0.2844
Left Hand	32.00	31.88	22.20	22.20	19.40	22.33	0.3558	0.3092
Right Leg	32.00	32.00	22.31	22.31	46.36	50.51	1.1065	1.0155
Left Leg	32.00	32.00	22.32	22.32	35.33	31.93	1.3529	1.4967
Right Foot	32.00	32.03	22.34	22.34	10.58	9.56	0.9329	1.0329
Left Foot	32.00	32.04	22.36	22.36	10.54	9.75	0.9223	0.9969
Overall					269.98	264.24	0.8937	0.9131

Total Power (W) For All Sections: 264.242
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.9131

TEST NUMBER: 1954
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\timl_1_34beta\M0402TW6.TM1
DATE OF TEST: 03-09-2004
START TIME: 16:53:46
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,NEOPRENE BOOTS,NEOPRENE HOOD/GLOVES,LPSV VEST.
UNDERGARMENTS: 2-PIECE WINTER UNDERWEAR,2-PIECE LONG SLEEVE,LEGGED COTTON UNDERWEAR,HEAVY WEIGHT WOOL SOCKS.
ENVIRONMENT: 30 CM WAVE.
  POSITION: NATURAL FLOTATION POSITION.
  HUMIDITY: 50
  ENV. FLOW SPEED:
  DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: WRIST SEALS TAPED, 2 LITRES OF LEAKAGE ADDED TO THE SUIT SYSTEM.
STOP TIME: 17:23:46 MINUTES SINCE START OF TEST: 30.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.64 AVERAGE OVER TEST TIME: 9.64

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.49	16.85	16.85	39.24	38.10	0.3760	0.3872
Chest	29.00	29.09	19.45	19.45	17.22	19.49	1.1345	1.0026
Back	29.00	28.93	19.29	19.29	81.50	82.36	0.2540	0.2513
Abdomen	29.00	29.00	19.37	19.37	7.61	9.53	0.9018	0.7201
Buttocks	27.00	26.91	17.28	17.28	45.05	46.56	0.2131	0.2062
Right Arm	29.00	29.00	19.37	19.37	26.07	23.10	0.5445	0.6145
Left Arm	29.00	29.00	19.36	19.36	19.67	18.96	0.6477	0.6722
Right Hand	29.00	28.91	19.28	19.28	21.77	21.42	0.2805	0.2850
Left Hand	29.00	28.94	19.31	19.31	16.36	19.24	0.3670	0.3120
Right Leg	29.00	29.00	19.37	19.37	115.27	121.83	0.3862	0.3654
Left Leg	29.00	29.00	19.36	19.36	132.64	113.68	0.3126	0.3647
Right Foot	29.00	29.01	19.38	19.38	4.98	6.47	1.7183	1.3240
Left Foot	29.00	29.03	19.39	19.39	9.82	7.39	0.8589	1.1405
Overall					537.20	528.13	0.3951	0.4017

Total Power (W) For All Sections: 528.130
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.4017

STOP TIME: 17:53:46 MINUTES SINCE START OF TEST: 60.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 9.63 AVERAGE OVER TEST TIME: 9.63

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	26.50	26.49	16.86	16.86	27.29	37.14	0.5409	0.3974
Chest	29.00	29.09	19.46	19.46	19.20	19.23	1.0177	1.0164
Back	29.00	28.94	19.31	19.31	81.56	81.84	0.2539	0.2531
Abdomen	29.00	29.00	19.37	19.37	6.73	9.24	1.0193	0.7425
Buttocks	27.00	26.95	17.31	17.31	45.68	46.25	0.2106	0.2080
Right Arm	29.00	29.00	19.37	19.37	25.06	23.57	0.5664	0.6023
Left Arm	29.00	29.00	19.37	19.37	19.60	19.37	0.6504	0.6581
Right Hand	29.00	28.91	19.28	19.28	21.00	21.42	0.2908	0.2850
Left Hand	29.00	28.94	19.30	19.30	17.55	19.42	0.3421	0.3091
Right Leg	29.00	29.00	19.37	19.37	121.62	122.01	0.3661	0.3649
Left Leg	29.00	29.00	19.37	19.37	108.69	111.27	0.3816	0.3727
Right Foot	29.00	29.01	19.38	19.38	7.34	6.51	1.1668	1.3155
Left Foot	29.00	29.03	19.39	19.39	8.85	7.31	0.9533	1.1534
Overall					510.17	524.58	0.4171	0.4047

Total Power (W) For All Sections: 524.582
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.4047

TEST NUMBER: 1946
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\timl_1_34beta\M0401SW1.TM1
DATE OF TEST: 01-08-2004
START TIME: 09:32:52
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,LEATHER FLIGHT BOOTS,NEOPRENE HOOD/GLOVES.
UNDERGARMENTS: LINER NUMBER TUQH THINSULATE.
ENVIRONMENT: STIRRED WATER.
POSITION: NATURAL FLOTATION POSITION.
HUMIDITY: 65
ENV. FLOW SPEED:
DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: ACCIDENTAL LEAKAGE THROUGH WRIST SEALS = 300G
STOP TIME: 11:32:51 MINUTES SINCE START OF TEST: 120.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 12.93 AVERAGE OVER TEST TIME: 12.93

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	32.00	32.00	19.08	19.08	10.30	13.37	1.6207	1.2493
Chest	32.00	32.10	19.18	19.18	9.71	10.32	1.9850	1.8674
Back	32.00	31.99	19.07	19.07	73.31	66.64	0.2791	0.3070
Abdomen	32.00	32.00	19.07	19.07	10.39	10.37	0.6503	0.6512
Buttocks	32.00	32.00	19.07	19.07	15.40	13.44	0.6881	0.7882
Right Arm	32.00	32.00	19.07	19.07	32.95	27.51	0.4242	0.5080
Left Arm	32.00	32.00	19.07	19.07	31.20	24.12	0.4023	0.5204
Right Hand	32.00	32.03	19.11	19.11	21.18	15.88	0.2858	0.3812
Left Hand	32.00	32.03	19.11	19.11	13.95	16.20	0.4260	0.3668
Right Leg	32.00	32.00	19.07	19.07	71.74	71.30	0.6111	0.6149
Left Leg	32.00	32.00	19.07	19.07	58.62	62.09	0.6967	0.6578
Right Foot	32.00	32.00	19.07	19.07	17.28	17.21	0.4877	0.4898
Left Foot	32.00	31.99	19.07	19.07	18.41	18.11	0.4504	0.4578
Overall					384.43	366.56	0.5557	0.5828

Total Power (W) For All Sections: 366.558
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.5828

STOP TIME: 13:32:51 MINUTES SINCE START OF TEST: 240.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 12.94 AVERAGE OVER TEST TIME: 12.93

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	32.00	32.00	19.07	19.07	7.87	13.09	2.1221	1.2759
Chest	32.00	32.10	19.17	19.18	6.66	10.38	2.8896	1.8552
Back	32.00	31.99	19.06	19.06	73.34	69.31	0.2788	0.2951
Abdomen	32.00	32.00	19.06	19.07	11.93	10.63	0.5660	0.6355
Buttocks	32.00	32.00	19.06	19.07	14.55	14.11	0.7278	0.7507
Right Arm	32.00	32.00	19.06	19.07	43.04	32.51	0.3246	0.4299
Left Arm	32.00	32.00	19.06	19.07	36.15	26.87	0.3470	0.4669
Right Hand	32.00	32.03	19.09	19.10	21.07	16.13	0.2870	0.3751
Left Hand	32.00	32.02	19.09	19.10	20.68	16.47	0.2870	0.3606
Right Leg	32.00	32.00	19.06	19.07	78.18	71.81	0.5605	0.6104
Left Leg	32.00	32.00	19.06	19.07	78.04	62.93	0.5229	0.6488
Right Foot	32.00	32.00	19.06	19.07	14.48	17.81	0.5817	0.4732
Left Foot	32.00	31.99	19.05	19.06	15.94	18.67	0.5199	0.4439
Overall					421.91	380.71	0.5060	0.5610

Total Power (W) For All Sections: 380.712
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.5610

TEST NUMBER: 1947
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\tim1_1_34beta\M0401SW2.TM1
DATE OF TEST: 01-09-2004
START TIME: 10:40:57
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,LEATHER FLIGHT BOOTS,NEOPRENE HOOD/GLOVES.
UNDERGARMENTS: LINER NUMBER FQH FOAM.
ENVIRONMENT: STIRRED WATER.
  POSITION: NATURAL FLOTATION POSITION.
  HUMIDITY: 65
  ENV. FLOW SPEED:
  DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: ACCIDENTAL LEAKAGE THROUGH WRIST SEALS = 300G, 20G IN THE SOCKS.
STOP TIME: 12:40:57 MINUTES SINCE START OF TEST: 120.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 12.35 AVERAGE OVER TEST TIME: 12.35

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	32.00	32.01	19.65	19.65	12.55	11.56	1.3707	1.4888
Chest	32.00	32.11	19.76	19.76	17.36	13.54	1.1436	1.4663
Back	32.00	32.00	19.65	19.65	19.24	21.55	1.0960	0.9782
Abdomen	32.00	32.01	19.66	19.66	12.94	12.95	0.5380	0.5376
Buttocks	32.00	32.01	19.66	19.66	12.22	11.50	0.8937	0.9493
Right Arm	32.00	32.00	19.64	19.64	24.78	24.99	0.5810	0.5761
Left Arm	32.00	32.00	19.64	19.64	27.88	26.29	0.4637	0.4918
Right Hand	32.00	31.99	19.63	19.63	17.75	18.19	0.3505	0.3420
Left Hand	32.00	31.95	19.60	19.60	17.28	19.23	0.3528	0.3170
Right Leg	32.00	32.00	19.65	19.65	75.86	72.74	0.5953	0.6209
Left Leg	32.00	32.00	19.65	19.65	69.66	61.69	0.6040	0.6820
Right Foot	32.00	31.99	19.64	19.64	22.90	20.66	0.3789	0.4200
Left Foot	32.00	31.99	19.64	19.64	22.25	19.33	0.3837	0.4417
Overall					352.66	334.21	0.6239	0.6583

Total Power (W) For All Sections: 334.211
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.6583

STOP TIME: 14:40:57 MINUTES SINCE START OF TEST: 240.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 12.37 AVERAGE OVER TEST TIME: 12.36

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	32.00	32.01	19.64	19.65	13.60	11.69	1.2640	1.4712
Chest	32.00	32.10	19.73	19.75	16.44	14.60	1.2054	1.3592
Back	32.00	32.00	19.63	19.64	25.04	22.90	0.8410	0.9202
Abdomen	32.00	32.00	19.64	19.65	12.50	12.75	0.5562	0.5457
Buttocks	32.00	32.00	19.63	19.65	13.91	11.73	0.7840	0.9306
Right Arm	32.00	32.00	19.63	19.64	32.53	27.66	0.4423	0.5204
Left Arm	32.00	32.00	19.63	19.64	27.68	29.18	0.4668	0.4429
Right Hand	32.00	31.98	19.62	19.63	17.22	18.09	0.3610	0.3437
Left Hand	32.00	31.98	19.61	19.60	16.12	19.00	0.3783	0.3209
Right Leg	32.00	32.00	19.63	19.64	81.74	73.51	0.5521	0.6142
Left Leg	32.00	32.00	19.63	19.64	57.11	63.22	0.7362	0.6652
Right Foot	32.00	31.98	19.62	19.63	24.41	21.76	0.3551	0.3986
Left Foot	32.00	31.98	19.62	19.63	19.43	19.49	0.4390	0.4379
Overall					357.74	345.59	0.6146	0.6365

Total Power (W) For All Sections: 345.590
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.6365

TEST NUMBER: 1948
TEST TITLE: DRDC LINER EVALUATION.
FILE NAME: c:\Program Files\tim1_1_34beta\m0401sw3.TM1
DATE OF TEST: 01-12-2004
START TIME: 11:55:58
DESCRIPTION OF SUIT TESTED: MODIFIED CURRENT FLYER'S SUIT,LEATHER FLIGHT BOOTS,NEOPRENE HOOD/GLOVES.
UNDERGARMENTS: LINER NUMBER TQH THINSULATE.
ENVIRONMENT: STIRRED WATER.
POSITION: NATURAL FLOTATION POSITION.
HUMIDITY: 75
ENV. FLOW SPEED:
DIRECTION:
CABLE LENGTH: Short (50ft)
ADDITIONAL INFORMATION: ACCIDENTAL LEAKAGE THROUGH THE WRIST SEALS = 400G
STOP TIME: 13:55:57 MINUTES SINCE START OF TEST: 120.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 12.88 AVERAGE OVER TEST TIME: 12.88

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	32.00	32.00	19.12	19.12	20.73	13.27	0.8072	1.2616
Chest	32.00	32.11	19.22	19.22	7.11	9.43	2.7173	2.0478
Back	32.00	32.00	19.11	19.11	34.24	27.93	0.5989	0.7342
Abdomen	32.00	32.00	19.12	19.12	12.63	10.57	0.5362	0.6406
Buttocks	32.00	32.00	19.12	19.12	12.76	12.86	0.8325	0.8257
Right Arm	32.00	32.00	19.11	19.11	32.31	30.01	0.4335	0.4667
Left Arm	32.00	31.99	19.11	19.11	37.56	28.76	0.3348	0.4373
Right Hand	32.00	31.96	19.07	19.07	19.91	19.62	0.3034	0.3079
Left Hand	32.00	32.00	19.11	19.11	18.39	17.77	0.3231	0.3344
Right Leg	32.00	32.00	19.12	19.12	81.86	76.62	0.5368	0.5735
Left Leg	32.00	32.00	19.11	19.11	66.34	65.44	0.6170	0.6254
Right Foot	32.00	32.00	19.12	19.12	22.48	17.54	0.3757	0.4817
Left Foot	32.00	31.98	19.10	19.10	20.76	19.62	0.4000	0.4233
Overall					387.10	349.43	0.5529	0.6125

Total Power (W) For All Sections: 349.435
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.6125

STOP TIME: 15:55:57 MINUTES SINCE START OF TEST: 240.00
ENVIRONMENT TEMPERATURE:
INSTANTANEOUS: 12.88 AVERAGE OVER TEST TIME: 12.88

SECTION	SETPOINT (Deg C)	SKINTEMP (Deg C)	TEMP DIFF (Deg C) INSTANT	TEMP DIFF (Deg C) AVERAGE	POWER (WATTS) ST	POWER (WATTS) LT	INSULATION (CLO) ST	INSULATION (CLO) LT
Head	32.00	32.00	19.13	19.12	11.99	12.83	1.3961	1.3042
Chest	32.00	32.10	19.23	19.22	7.46	9.55	2.5896	2.0218
Back	32.00	32.00	19.12	19.12	42.16	33.95	0.4866	0.6042
Abdomen	32.00	32.00	19.12	19.12	10.34	10.42	0.6548	0.6502
Buttocks	32.00	32.00	19.12	19.12	14.63	12.93	0.7259	0.8212
Right Arm	32.00	32.00	19.12	19.12	38.51	33.98	0.3639	0.4124
Left Arm	32.00	32.00	19.12	19.12	38.25	32.84	0.3290	0.3831
Right Hand	32.00	31.97	19.09	19.08	22.18	19.28	0.2726	0.3135
Left Hand	32.00	31.98	19.10	19.11	15.49	17.79	0.3834	0.3340
Right Leg	32.00	32.00	19.12	19.12	79.27	78.27	0.5545	0.5615
Left Leg	32.00	32.00	19.12	19.12	67.39	66.45	0.6076	0.6160
Right Foot	32.00	32.00	19.12	19.12	18.90	17.84	0.4472	0.4737
Left Foot	32.00	31.98	19.10	19.10	18.44	19.92	0.4503	0.4169
Overall					385.01	366.05	0.5561	0.5848

Total Power (W) For All Sections: 366.052
Total Area (Square Meters): 1.736
Overall Insulation Resistance (CLO): 0.5848

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14. ABSTRACT

(U) As part of Thrust 3id12 and a tasking from the Air forces, DRDC Toronto required testing to be conducted on a thermal manikin to evaluate the thermal performance of land and sea survival equipment. this report details the results of using the current flyer's coverall immersion suit with three (3) prototype thermal liners in still and turbulent water (30 cm wave). these results will be compared to values recorded from human subjects using the same wave height tested at the same test facility (wave tank)

(U) Dans le cadre du vecteur 3id12 et d'une tâche assignée par les Forces aériennes, RDDC Toronto a exigé qu'on fasse des essais sur un mannequin thermique pour évaluer la performance thermique d'un équipement de survie terrestre et marin. Le présent rapport donne en détail les résultats du port d'une tenue d'hiver à l'état sec et au mouillé, dans un canot de sauvetage, courant et proposé, des sacs de couchage et des éléments auxiliaires, utilisant un lit de survie isolant simulé, fait de branches maîtresses d'épicéa. Ces résultats fourniront la base de tests menés sur des sujets humains utilisant le même équipement de survie marin et les mêmes installations d'essai (cuves à houle).

15. KEYWORDS, DESCRIPTORS or IDENTIFIERS

(U) immersion suits; thermal resistance; water survival; cold water